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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/080,913	02/21/2002	Luu Thanh Nguyen	NSC1P131X1	1176
22434	7590	10/19/2005	EXAMINER	
BEYER WEAVER & THOMAS LLP P.O. BOX 70250 OAKLAND, CA 94612-0250			FARAHANI, DANA	
			ART UNIT	PAPER NUMBER
			2891	

DATE MAILED: 10/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

4.8

Office Action Summary	Application No.	Applicant(s)	
	10/080,913	NGUYEN ET AL.	
	Examiner	Art Unit	
	Dana Farahani	2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 July 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 19-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 19-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>9/1/05</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 19, 22-24, and 26-31 are rejected under 35 U.S.C. 103(a) as being anticipated by Nishiguchi et al., hereinafter Nishiguchi (U.S. Patent 5,214,308), in view of Abe et al., hereinafter Abe (US Patent 6,288,444), all previously cited.

Regarding claims 19, 22, 24, 27 and 28, Nishiguchi discloses in figures 2 and 3 an apparatus comprising a flip chip integrated circuit 1 having bond pads with solder bumps 2 formed directly on an active surface of the flip chip; and a layer of an underfill layer (not shown, see column 3, lines 45-52) is formed on the active surface, and around the bumps of the flip chip integrated circuit.

Nishiguchi does not disclose the underfill layer have cut edges.

Abe discloses an underfill, 14 of figure 2 has cut edges at the periphery of the chip in the figure (see column 10, lines 39-46). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to cut the bonding agent of the Nishiguchi's structure at the periphery of the chip therein, in order to remove the excess bonding agent from the periphery of the chip, from the surface of substrate 3 (therefore maintaining the surface of the substrate free from excess particles), and prevent any probable spill of the bonding agent from the periphery of the substrate.

Regarding claim 26, the substrate 3 has a plurality of contact pads 5, which connect the flip chip to the substrate.

Regarding claim 23, Nishiguchi discloses the limitation in claim 23, as discussed above, except for the relative dimensions of the bumps and the adhesive. It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the contact bumps smaller or larger according to a specific application of the chip assembly. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 16 USPQ 2d 1934, 1936 (Fed. Cir. 1990).

Regarding claims 29-31, Nishiguchi discloses the limitations in the claims, as discussed above, except for the range of coefficient of thermal expansion of the adhesive, and other properties of the adhesive mentioned in those claims. It would have been obvious to one of ordinary skill in the art at the time of the invention to choose appropriate range of coefficient of thermal expansion for a particular application, in accordance with the environment that the chip would be used. See *In re Aller*, 105 USPQ 233, for the proposition that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art.

3. Claims 20 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishiguchi in view of Abe, as applied to claim 19 above, and further in view of Kato (U.S. Patent 6,486,562), previously cited.

Nishiguchi in view of Abe discloses the limitations in claims 19 and 20, as discussed above, except for the adhesive being an epoxy resin.

Kato discloses at column 2, lines 10-15, that epoxy resin is used to increase mechanical coupling between a substrate and a flip chip. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use epoxy resin as the adhesive in Nishiguchi structure in order to enhance mechanical coupling between the substrate and the flip chip.

4. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nishiguchi in view of Abe, as applied to claim 19 above, and further in view of Morihara (U.S. Patent 5,495,439), previously cited.

Nishiguchi in view of Abe discloses the limitations in claims 19 and 21, as discussed above, except for coefficient of thermal expansion of the substrate is substantially similar to the adhesive.

Morihara discloses a device package wherein an adhesive layer has coefficient of thermal expansion same as a substrate in which it is located. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the device in Schuelle such that coefficient of thermal expansion of the adhesive is same as the substrate to reduce stress related failures due to coefficient of thermal expansion mismatch between the substrate and the adhesive layer.

5. Claims 32-34 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishiguchi in view of Abe, as applied to claim 19 above, and further in view of Chiu et al., hereinafter Chiu (U.S. Patent 6,391,683), previously cited.

Nishiguchi in view of Abe discloses the limitations in those claims, as discussed above, except for a dam around the underfill adhesive and a solder, or fluxing material on the substrate. Chiu discloses in figure 3C dam 111 around resin 141, and resin 141 is on substrate 110. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a resin material on the substrate of Nishiguchi, and further form a dam around it in order to support the contacts 34 of the Nishiguchi structure, while preventing the material from flowing to peripheral areas of the substrate.

6. Claims 35, 36, and 39, are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishiguchi in view of Holzapfel et al., hereinafter Holzapfel (U.S. Patent 5,872,633), previously cited.

Nishiguchi discloses the limitations in the claims, as discussed above, except for a plurality of dies.

Holzapfel discloses in figure 6 a semiconductor device with a plurality of dies 406.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a plurality of dies in the Nishiguchi reference in order to make an array of chip packages to be used in various applications, as this is common in the semiconductor manufacturing industry.

7. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nishiguchi in view Holzapfel.

Nishiguchi and Holzapfel disclose the limitation in claim 35, as discussed above, except for the relative dimensions of the bumps and the adhesive. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results

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arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 F.2d 1575, 16 USPQ 2d 1934, 1936 (Fed. Cir. 1990). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the contact bumps smaller or larger according to a specific application.

8. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nishiguchi in view Holzapfel, as applied to claim 35 above, and further in view of Kato (U.S. Patent 6,486,562), previously cited.

Nishiguchi and Holzapfel disclose the limitation in the claim, as discussed above, except for the adhesive being an epoxy resin.

Kato discloses at column 2, lines 10-15, that epoxy resin is used to increase mechanical coupling between a substrate and a flip chip. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use epoxy resin as the adhesive in Nishiguchi structure in order to enhance mechanical coupling between the substrate and the flip chip.

9. Claims 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishiguchi in view Holzapfel.

Nishiguchi in view Holzapfel renders obvious the limitations in the claims, except for the range of coefficient of thermal expansion of the adhesive, and other properties of the adhesive mentioned in those claims. It would have been obvious to one of ordinary skill in the art at the time of the invention to choose appropriate range of coefficient of thermal expansion for a particular application in which the chip assembly is being used. It has been held that where the

general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Response to Arguments

10. Applicant's arguments filed 7/27/05 have been fully considered but they are not persuasive.

Regarding applicant's presumption that the rejection under 102(e) was meant to be a rejection under 103(a), the Office informs the applicant that the rejection is in fact meant to be a rejection under 103(a), and therefore, the typographical error is now corrected to recite a rejection under 35 USC 103(a).

Regarding applicant's argument that the underfill material at the edges of the Nishiguchi reference would have been uneven, while the Office agrees to this statement, what is claimed is cut edges. A secondary reference, the Abe reference, is cited to address this limitation. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Regarding applicant's argument that the Abe reference is directed toward a fine pitch Ball Grid Array (BGA) package, while the claimed invention is directed to a flip chip type integrated circuit (IC), and some other differences which are pointed out between that reference and the claimed device of the instant application (see page 8 of the remarks by the applicant), the limitations that are pointed out can be found in the Nishiguchi reference, as discussed in the above rejections. As stated in the above case laws, one cannot show nonobviousness by

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attacking references individually where the rejections are based on combinations of references. Furthermore, applicant alleges that the resin layer 14A of the Abe reference does not enhance the bonding of the Abe package to a substrate. This limitation can be found in the Nishiguchi reference as well. In another words, all the structural limitations pointed out by the applicant are in the Nishiguchi reference, as discussed in the above rejections. The Abe reference is cited to address the limitation of cut edges.

Regarding applicant's argument that the references are not combinable, applicant recites the structural differences between the two references (see page 9, third paragraph of applicant's remarks). Applicant concludes that there is no teaching or motivation to combine the references. The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, as stated above, all the limitations are in the primary reference, and the motivation as to why a person with ordinary skill in the art would want to cut the underfill of that reference is mentioned in the above rejections.

Applicant alleges that the layer 14 of the Abe reference is not a bonding layer, but a protective layer. However, since it is resin layer, it has inherent bonding properties. Even the Abe reference mentions that it is a fixing (i.e. bonding) member (see col. 10, lines 26-29). Applicant further argues that it is not clear how the proposed cutting to remove excess bonding agent "from the surface of the substrate" could be performed without damaging the

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underlying substrate. However, the package of Nishiguchi can be collectively cut, even the substrate (see for example figure 7, wherein the substrate/device 3 and the device 1, along with any underfill that may be applied there between; see col. 6, lines 6-18; have an even, vertical edge; therefore, they may be collectively cut provided that there is a motivation to do so, which is set forth in the above rejections), as Abe teaches, and still satisfy the requirement of the limitations in the claims.

Conclusion.

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

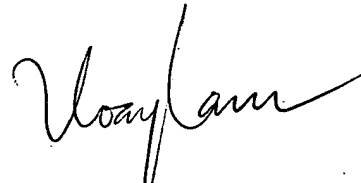
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dana Farahani whose telephone number is (571)272-1706. The examiner can normally be reached on M-F 9:00AM - 6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571)272-1722. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

D. Farahani



HOAI PHAM
PRIMARY EXAMINER